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have been identified with European forms. One of the genera is reported only from the Lias and the other ranges from the Lias to the Trias and Tertiary. Besides these fucoids, the worm tubes referred to above and a new genus of lamellibranch are used in determining geological age; as stated in the text, the evidence furnished by the worm-burrows and the molluscan shell is purely inferential, but so far as it goes corroborates that of the fossil algae as to a Liassic age. To one who is not an expert in paleontology, the arguments presented both as to correlating the widely separated terranes now referred to the Yakutat formation, and the assignment of that formation to a subdivision of the Jurassic, seem based on meager data. Among the results presented by the geologist is the evidence of Eocene strata on the Alaskan peninsula. The fossils collected at various localities form the basis for describing thirty-eight new species, twelve Jurassic and the remainder Tertiary. The Jurassic fossils include seven new genera. The descriptions of new species are accompanied by twenty-five admirable plates.

In the chapter on general geology, page 12, in describing the basaltic region about Shoshone Falls, Idaho, mention is made of 'great pustules which had been inflated on the surface of the liquid mass and then congealed and collapsed.' This explanation of the origin of the numerous 'pressure ridges' of the Snake River lava plains is so widely at variance with the conclusion reached by myself after gaining considerable familiarity with them, that it seems advisable to refer the reader to a more extended account of their characteristic, namely, U. S. Geological Survey, Bulletin No. 199, 1902, pp. 95-96.

The advantages presented by Alaska for glacial studies has already been referred to, and the reports of the geologists of the Harriman expedition, if we had no other evidence, suffice to show that the same land has an instructive geological history. Although the reports under review contain a few admirable pictures of volcanoes, only one, Bogoslof, seems to have been visited. As is well known, however, the volcanoes of Alaska present a

subject for study fully as extensive and equally instructive as its glaciers, but one concerning which but little definite information is available. Another region of special interest which invites investigation and gives promise of valuable return is the vast tundra in the far north. Concerning one of these great groups of earth features, namely, the glaciers, the Harriman expedition has done good service not only in recorded results, but in indicating the richness of the field that remains to be explored. The others, as is well known, are fully as important and equally inviting. The suggestion I wish to convey by these statements is that there are room and material for study in Alaska for many more expeditions. The great and lasting results recorded in the reports of the Harriman expedition should encourage other broad-minded citizens to immortalize their names in a similar manner.

ISRAEL C. RUSSELL.

SOCIETIES AND ACADEMIES.

THE MICHIGAN ACADEMY OF SCIENCE.

The tenth annual meeting of the Michigan Academy of Science was held at Ann Arbor, on March 31 and April 1 and 2. The new medical building, the university museum and the laboratories of botany and zoology of the University of Michigan were placed at the disposal of the academy for its sessions. The officers for this meeting were:

President—Professor F. C. Newcombe, Ann Arbor.

Vice-Presidents—Section of Agriculture, Professor W. J. Beal, Agricultural College; Section of Botany, Mr. B. O. Longyear, Agricultural College; Section of Geography and Geology, Professor I. C. Russell, Ann Arbor; Section of Sanitary Science, Professor C. E. Marshall, Agricultural College; Section of Zoology, Professor R. H. Pettit, Agricultural College.

Treasurer—Professor H. L. Clark, Olivet.

Librarian—Dr. G. P. Burns, Ann Arbor.

Secretary—Dr. Jas. B. Pollock, Ann Arbor.

The meeting opened Thursday, March 31, with a general business session at 2 p.m. Following the adjournment of this general session the various sections met for the reading of papers. Thursday evening no session

of the academy was held, as the members were invited to attend the dedication of the new science building at the State Normal College at Ypsilanti, Mich. Friday forenoon was devoted to the reading of papers in the various sections. In the afternoon the academy convened in general session and the retiring president, Professor F. C. Newcombe, of the University of Michigan, delivered the presidential address, taking as his subject 'The Manner and Means of a Natural History Survey of Michigan.' This address will be published in full in the annual report of the academy. The subject is one to which the academy is devoting much attention, and it is hoped that at the next session of the state legislature a law will be passed authorizing a natural history survey for Michigan, similar to those already established in other states. Following the presidential address the remainder of the Friday afternoon session was devoted to a discussion of the 'Forestry Interests of Michigan,' with the following program:

CHARLES W. GARFIELD, president State Forestry Commission, Grand Rapids: 'The State's Work in Forestry.'

JOHN BISSEL, Detroit: 'Forestry of Michigan from a Business Man's Standpoint.'

FILIBERT ROTH, University of Michigan, Ann Arbor: 'The Next Step in Forestry in Michigan.'

J. W. CLARK, of the U. S. Bureau of Forestry, Washington, D. C.: 'The Work of the Bureau of Forestry in Michigan.'

W. J. BEAL, Agricultural College: 'Lantern Views of Seedlings and Young Forest Trees.'

E. E. BOGUE, Agricultural College: 'Forestry Plantations in Michigan.'

C. A. DAVIS, University of Michigan, Ann Arbor: 'Condition of the Wood Lot in Michigan.'

On Friday evening Professor John M. Coulter, of the University of Chicago, delivered the annual address in Sarah Caswell Angell Hall. The subject was 'A Neglected Naturalist,' and under this title a most interesting account of the life and work of Rafinesque was given. Immediately following Professor Coulter's address the visiting members of the academy were the guests of the Research Club of the University of Michigan at an informal reception and smoker.

On Saturday morning a general session was devoted to a discussion of the 'Fish and Game Interests of Michigan.' The following papers were presented at this time:

F. N. CLARK, Supt. of U. S. Fish Hatchery, Northville: 'Commercial Fish and Fisheries.'

CHARLES E. BREWSTER, Chief Deputy, Department of Game and Fish Warden, Sault Ste. Marie: 'The Commercial Fishes of the Great Lakes.'

F. B. DICKERSON, of the Michigan Fish Commission, Detroit: 'The Benefit to the State of the Artificial Propagation of Game Fish.'

C. H. CHAPMAN, State Game Warden: 'Game Animals.'

L. WHITNEY WATKINS, of the Agriculture College Board, Manchester: 'Game Birds.' (By title.)

In the meetings of the various sections of the academy the following papers were read:

SECTION OF BOTANY.

G. P. BURNS, Ann Arbor: 'Ecological Survey of the Huron River Valley, IV., Dead Lake.'

MISS LURA WARNER, Ann Arbor: 'Regeneration of Root Tips after Splitting.'

MISS MARY E. HEDDEN, Ann Arbor: 'Conditions Influencing Regeneration of the Hypocotyl in *Linum usitatissimum*.'

MISS ANNABEL W. CLARK, Ann Arbor: 'Regeneration of the Epicotyl in Seedlings of *Vicia Faba* and *Pisum sativum*.'

MISS JULIA A. HAYNES, Ann Arbor: 'Angle of Deviation at which Stems Show the Strongest Response.'

W. N. FULLER, Ann Arbor: 'Statocyst Function of Starch Grains in the Root Tip.' (By title.)

A. W. PIERSON, Ann Arbor: 'The Occurrence of *Basisporium Gallarum* Moliard in Michigan.'

C. A. DAVIS, Ann Arbor: 'The Rough Barked and Smooth Barked White Oaks.'

F. H. LOEW, Agricultural College: 'Importance of Plant Variation and Its Bearing on the Evolution of Species.'

S. ALEXANDER, Detroit: 'Some Interesting Michigan Plants, Possibly Some New Species.'

W. J. BEAL, Agricultural College: 'A New Edition of the Michigan Flora.'

J. B. DANDENO, Agricultural College: 'The Relation of Mass Action and Physical Affinity to Toxicity of Solution.'

E. E. BOGUE, Agricultural College: 'Educational Requirements for the Profession of Forestry.' (By title.)

W. J. BEAL, Agricultural College: 'Extension Work in Agriculture.'

SECTION OF ZOOLOGY.

RAYMOND PEARL and MISS MARY H. BURR, Ann Arbor: 'A Statistical Study of Conjugation in *Paramaecium*.'

MISS FRANCES J. DUNBAR, Ann Arbor: 'Methods Used in Cultivating Pure Strains of *Paramaecium*.'

MISS JEAN DAWSON, Ann Arbor: 'On the Occurrence of a Gill in *Planorbus*.'

BRYANT WALKER, Detroit: 'Variation in the Forms of *Succinea ovalis*.'

A. G. RUTHVEN, Ann Arbor: 'Notes on the Mollusks, Reptiles and Amphibians of Porcupine Mountains, Mich.'

J. PLAYFAIR McMURRICH, Ann Arbor: 'A New Type of Cerianthid and Its Significance.' (By title.)

ELLIS MICHAEL, Ann Arbor: 'Fish Fauna of Michigan.'

H. L. CLARK, Olivet: 'A Michigan Biological Survey.'

J. E. DURDEN, Ann Arbor: 'The Antiquity of the Zoanthid Actinians.'

H. L. CLARK, Olivet: 'Snake Notes,' illustrated with specimens.

H. L. CLARK, Olivet: 'The Variability of Snakes.'

C. F. CURTIS RILEY, Ann Arbor: 'Some Reactions of the Agrionidæ Larvæ.'

S. J. HOLMES, Ann Arbor: 'Some Observations on Phototaxis.'

J. E. DURDEN, Ann Arbor: 'An Exhibit Showing Commensalism of Crab and Actinian.'

SECTION OF GEOGRAPHY AND GEOLOGY.

FRANK LEVERETT, Ann Arbor: 'Bed Rock Topography of the Southern Peninsula of Michigan.'

A. C. LANE, Lansing: 'The Theory of Copper Deposition.'

A. C. LANE, Lansing: 'The Development of the Igneous Magma.'

A. C. LANE, Lansing: 'Artesian Wells Along the North Shore of Lake Michigan.'

I. C. RUSSELL, Ann Arbor: 'The Glaciers of the Three Sister Peaks, Oregon,' illustrated.

FRANK LEVERETT, Ann Arbor: 'The Glacial Geology of the Ann Arbor Quadrangle.' (By title.)

ISAIAH BOWMAN, Ypsilanti: 'A Case of Steam Capture at Rawsonville, Michigan.'

H. W. BERGER: 'Gravel Deposits on Marl at the Shore of Bass Lake, Livingston County, Michigan.'

I. C. RUSSELL, Ann Arbor: 'Lava Flows of the Deschutes Valley, Oregon,' illustrated. (By title.)

M. S. W. JEFFERSON, Ypsilanti: 'The Valley of the Yuma River, Cuba,' illustrated.

M. S. W. JEFFERSON, Ypsilanti: 'Wind Effects.'

F. W. KELSEY, Ann Arbor: 'Vesuvius Before the Eruption of '79.'

SECTION OF SANITARY SCIENCE.

T. B. COOLEY: 'Report of the Pasteur Institute for the Year Ending April 1, 1904.'

MORTIMER WILLSON: 'Personal Hygiene for Life's Afternoon.'

GUY S. KIEFER: 'Some Problems in Sanitary Science.'

MISS CARRIE A. LYFORD: 'Domestic Science in Its Relation to Sanitary Science.'

MISS JENNETTE CARPENTER: 'The Object of Cookery in Schools.'

FLOYD W. ROBISON: 'Iron and Fiber in Their Relation to the Food of Man.'

V. C. VAUGHAN: 'The Result of Sixteen Years of Work in the Bacteriological Examination of Drinking Water.'

RALSTON WILLIAMS: 'Typhoid Germs in Sewage.'

T. F. MARSTON: 'What Pure Milk Production Means to the Producer.' (By title.)

IRA O. JOHNSON: 'The Significance and Production of Walker-Gordon Milk.'

CHARLES E. MARSHALL: 'Associative Action of Bacteria in the Souring of Milk.'

H. B. BAKER: 'A Problem in Terrestrial Physics—What Causes the Earth's Rotation.'

T. B. COOLEY: 'Gun Shot Wounds and Tetanus.'

D. J. LEVY: 'Filtration of Enzymes.'

FRED MUNSON and W. R. SPENCER: 'A Preliminary Report on the Presence of Toxin in Liver Cells.'

DONALD MCINTYRE: 'The Intercellular Toxin of *B. pyocyanus*.'

M. W. CLIFT: 'The Chemical Tests for Morphine in the Presence of Putrefactive Substances.'

D. J. LEVY: 'An Actinomyces Isolated from Man.'

L. M. GELSTON: 'Filtration of Virus of Rabies Through Paper.'

WARD J. MCNEAL: 'An Improved Medium for Cultivating *Trypanosoma Brucei*.'

F. G. NOVY and W. J. MCNEAL: 'Cultivation of *Trypanosoma Evansi*.'

F. G. NOVY and W. J. MCNEAL: 'Filtration and Agglutination of Trypanosomes.'

H. R. TERREY: 'A New Phosphorescing Organism.'

At the final business meeting on Saturday morning the following officers were elected for the ensuing year:

President—Dr. A. C. Lane, State Geologist, Lansing.

Vice-Presidents—Section of Agriculture, Professor W. J. Beal, Agricultural College; Section of Botany, Professor J. B. Dandeno, Agricultural College; Section of Geography and Geology, Professor M. S. W. Jefferson, State Normal College; Section of Sanitary Science, Dr. T. B. Cooley, director of the Pasteur Institute, Ann Arbor; Section of Science Teaching, Professor W. H. Sherzer, State Normal College; Section of Zoology, Dr. Raymond Pearl, University of Michigan.

Secretary and Treasurer—Professor C. E. Marshall, Agricultural College.

Librarian—Dr. G. P. Burns, University of Michigan.

At this meeting the academy voted to commence the publication of a bulletin, in addition to the annual reports now being issued. The bulletin will appear three times during the year, and will be in charge of an editorial committee consisting of the president, the secretary and Professor H. L. Clark, of Olivet. The principal object of this bulletin will be to disseminate among the people of the state who are interested in science, and especially among the teachers of science in the secondary schools, more information regarding the work the Academy of Science is doing than they now get from the existing publication.

RAYMOND PEARL.

THE IOWA ACADEMY OF SCIENCES.

THE eighteenth annual meeting of the Iowa academy was held in the physical lecture room of the State University of Iowa, Iowa City, April 14 and 15. The following papers were presented:

BRUCE FINK: President's address, 'Two Centuries of American Lichenology.'

GILBERT L. Houser: 'The Animal Cell in the Light of Recent Work.'

W. S. HENDRIXSON: 'The Action of Chloric Acid on Metals.'

GERSHOM H. HILL: 'The Importance of Vital Statistics in the Study of Social Science.'

T. E. SAVAGE: 'A Buried Peat Bed and Associated Deposits in Dodge Township, Union County.'

L. H. PAMMEL: 'Some Notes on Iowa Flora.'

NICHOLAS KNIGHT: 'Some Features in the Analysis of Dolomite Rock.'

NICHOLAS KNIGHT: 'The Softening of Hard Water.'

L. H. PAMMEL, EDNA KING and R. E. BUCHANAN: 'Some Bacteriological Examinations of Iowa Waters.'

LAUNCELOT W. ANDREWS: 'The Determination of Chlorides by Means of Silver Chromate.'

ARTHUR W. MARTIN: 'A Chemical Study of *Rhus glabra*.'

J. E. GUTHRIE: 'The 'Furcula' in the Collembola.'

R. I. CRATTY: 'The Flora of Emmet County, Iowa.'

W. M. BARR: 'Action of Sodium Thiosulphate on Silver Salts.'

JOHN J. LAMBERT: 'Regeneration in the Crayfish.'

C. F. LORENZ: 'Single Lantern Stereoscopic Projection in Color.'

G. E. FINCH: 'Notes on the Position of *Nileus vigilans* in Strata at Elgin, Iowa.'

R. E. BUCHANAN: 'The Development of the Plum, *Prunus americana*.'

B. SHIMEK: 'Additions to the Iowa Flora.'

H. W. NORRIS: 'The so-called Dorsotrachealis Branch of the Seventh Cranial Nerve in *Amphiuma*.'

H. W. NORRIS: 'The Vagus and Anterior Spinal Nerves in *Amphiuma*.'

KATY A. MILLER: 'The Lichen Flora of 'The Ledges,' Boone County, Iowa.'

W. S. HENDRIXSON: 'A Method of Determining Chloric Acid.'

HARRIET M. CLEARMAN: 'A Geological Situation in the Lava Flow, with Reference to the Vegetation.'

JOHN C. FRAZEE: 'Synthesis of Ethyl Alcohol from Acetylene.'

EDWIN MORRISON: 'Old Experiments with New Apparatus.'

H. A. MUELLER: 'A Preliminary List of the Flowering Plants of Madison County.'

CHARLES R. KEYES: 'Remarkable Occurrence of Aurichalcite.'

CHARLES R. KEYES: 'Certain Basin Features of the High Plateau Region of Southwestern United States.'

CHARLES R. KEYES: 'Note on the Carboniferous Faunas of the Mississippi Valley in the Rocky Mountain Region.'

L. BEGEMAN: 'A Convenient Voltaic Cell.'

F. BONNET: 'A New Method of Determining Compressibility of Liquids and Solids.'

Officers for the ensuing year were elected as follows:

President—B. Shimek, Iowa City.

First Vice-President—L. H. Pammel, Ames.

Second Vice-President—M. F. Arey, Cedar Falls.

Secretary—T. E. Savage, Capitol Building, Des Moines.

Treasurer—H. W. Norris, Grinnell.

H. W. NORRIS,
Secretary.

THE RESEARCH CLUB OF THE UNIVERSITY OF
MICHIGAN.

THE following papers unreported in SCIENCE have been read at recent meetings of the club: At the December meeting Dr. A. B. Prescott gave an account of work upon the 'Organic Perhalides' done in his laboratory from 1895 to 1900. He had been attracted to this field (1) from the interest of the relations between perhalides and the double halides, (2) because of the molecular significance of supercompounds as such, (3) by reason of the remarkable rôle of iodine in the iodonium bases made known in 1894, (4) on account of the singular individuality of the periodides of the organic bases formed by nitrogen, and (5) in order to pursue the question, what sort of basal constitution is necessary to a perhalide. The systematic production of all perhalides of pyridine was entered upon, followed by those of the picolines, quinoline and the common vegetable bases, as has been published from this work up to 1901. In continuation the author desires to so extend the study as to find something of whatever value perhalide formation possesses as a distinguishing measure of chemical character, and whether or not confined to 'salt-forming bases.'

At the same meeting Dr. A. S. Warthin gave a summary of his most recent work on the haemolymph glands as he had found them in man and other animals.

At the February meeting Professors Asaph Hall and F. C. Newcombe gave an account of their researches. After explaining various methods employed in detecting errors of division in circles, Professor Hall submitted a table showing the division errors of the Lick meridian circle constructed by the Repsolds,

of that at Washington by Pistor and Martins, and of that at Ann Arbor, also by Pistor and Martins.

For the first two instruments the errors were obtained by keeping one circle fixed on the axis and continually shifting the other. For the Ann Arbor circle the errors were found by the methods of Bessel for the determination of special marks giving the following values for the ten degree divisions:

Division.	Error.
0	" 0.00
10	— 0.36
20	— 0.58
30	— 0.54
40	— 0.67
50	— 0.66
60	— 0.64
70	— 0.10
	+ 0.21

Professor Newcombe stated that the roots of many species of plants are known to bend against the current of a stream of water in which they may be placed. This rheotropic response was shown to be really a response to one-sided pressure, since the roots showed similar curves when they were wholly shielded from the stream of water by covering them with tubes of very thin collodion. The thigmotropism must be called forth either by the large extent of surface stimulated by the water stream, or by long continued irritation of the same cells in the sensory region, conditions which will rarely if ever be fulfilled in nature. The conclusion was drawn that, contrary to the general belief, terrestrial roots are not responsive to one-sided pressure such as they meet in nature.

At the March meeting Professor Wenley spoke on the relation of Plato's writings to modern research, and Professor Cushny discussed 'The Secretion of Acid by the Kidney.' Professor Cushny assumed that the renal tubules are chiefly engaged in absorbing some of the constituents of the glomerular fluid. By the intravenous injection of most neutral salts the urine was found neutral or feebly acid to phenolphthalein, while it was neutral or alkaline to litmus. The intravenous injection of phosphate rendered the urine acid to

phenolphthalein, while it was feebly acid or neutral to litmus; obstruction of one ureter now rendered the urine of that side more strongly acid. This was interpreted as indicating that the normal acidity of the urine is due to the absorption of sodium and hydroxyl or carbonate ions in the renal tubules. For the secretion of acid urine two conditions must be fulfilled: (1) There must be present in the blood and glomerular fluid a hydrolytically dissociated salt whose anion can not permeate the epithelium of the tubules, while the cation can permeate readily; (2) there must be an active absorption in the tubules.

FREDERICK C. NEWCOMBE,
Secretary.

THE AMERICAN MATHEMATICAL SOCIETY.

DURING the month of April the American Mathematical Society held three meetings. The Chicago Section met at Northwestern University on April 2, the San Francisco Section at Stanford University on April 30, and a regular meeting of the society was held at Columbia University, also on April 30. Reports of the sectional meetings will appear later in *SCIENCE*.

About fifty members attended the regular meeting in New York. The president of the society, Professor Thomas S. Fiske, occupied the chair. The following persons were elected to membership: J. J. Browne, Colorado School of Mines; C. E. Dimick, University of Pennsylvania; Wm. Gillespie, Princeton University; Clifford Gray, Columbia University; Louis Ingold, University of Missouri; Myrtle Knepper, State Normal School, Cape Girardeau, Mo.; F. M. Morrison, Buctel College; G. W. Myers, University of Chicago; Elijah Swift, Harvard University. Eight applications for admission to membership were received.

During the past year two important reports have been prepared by committees of the society and published in the *Bulletin*. The report of the committee on college entrance requirements has been adopted by the College Entrance Examination Board as the basis of its examinations in mathematics on and after June, 1905. The second report, prepared by

a committee of the Chicago Section, presents a unified scheme of requirements for the master's degree for candidates offering mathematics as the major subject. The society has also exerted, through its committee on relations to elementary mathematics, a guiding influence in the formation of associations of teachers of mathematics throughout the country. Several of these associations have already been organized under very favorable prospects, and others are already planned.

The following papers were read at the April meeting:

H. F. STECKER: 'Certain differential equations in relation to non-euclidean geometry.'

C. J. KEYSER: 'Certain line and plane quintic configurations in point 4-space, and their sphere analogues in ordinary space.'

E. V. HUNTINGTON: 'A set of independent postulates for the algebra of logic (third paper).'

O. D. KELLOGG: 'Sets of functions with pre-assigned singular points and monodromic group.'

J. M. PEIRCE: 'On certain complete systems of quaternion expressions and on the removal of metric limitations from the calculus of quaternions.'

E. O. LOVETT: 'Singular trajectories in the problem of four bodies.'

E. O. LOVETT: 'Systems of periplegmatic orbits.'

M. BÖCHER: 'The Gauss-Stieltjes equilibrium problem and the roots of polynomials.'

J. PIERPONT: 'On multiple integrals.'

E. L. DODD: 'Multiple sequences.'

V. SNYDER: 'On developable and tubular surfaces having spherical lines of curvature.'

C. H. SISAM: 'On self-dual scrolls.'

E. KASNER: 'The general transformation theory of differential elements.'

E. J. WILCZYNSKI: 'General theory of curves on ruled surfaces.'

H. TABER: 'On real hypercomplex number systems.'

For the evening the usual dinner was arranged; twenty-five members attended this agreeable diversion.

The summer meeting of the society will be held at St. Louis on September 16-17. The San Francisco Section will also meet in September. The next meeting of the Chicago Section will be held at the Christmas holidays.

F. N. COLE,
Secretary.

THE TORREY BOTANICAL CLUB.

THE meeting of February 24 was held at the New York Botanical Garden, Professor Underwood in the chair; sixteen persons present.

Dr. Britton referred to the opportunity of members to become applicants for a grant of fifty dollars from the John Strong Newberry Fund, which this year is available for botanical or zoological research.

The announced paper of the scientific program was by Mr. Percy Wilson under the title of 'Remarks on some Economic Plants of the East Indies.'

In the spring of 1901 Mr. Wilson was commissioned by the New York Botanical Garden to accompany the solar eclipse expedition to the East Indies organized by Professor Todd, of Amherst College, the chief purpose of Mr. Wilson's visit being to obtain collections of native plants and plant products for exhibition in the museum of the garden. Most of his collections were made on the island of Singkep, which is a two days' voyage southward from Singapore. This island is about twenty-five miles in length and sixteen in greatest width. Two thirds of it is covered with a dense tropical jungle, the remainder having small, scattered native villages. Various fiber products, starches and sugars, manufactured and used by the inhabitants of these villages, were shown. In discussing fiber products, examples were first exhibited in which a whole leaf or a considerable part of it is made use of. Of these leaf fibers, one of the most extensively utilized is from the leaves of the screw pines, whose generic name, *Pandanus*, is a Latinized form of the Malay word 'pandan,' a name applied to many species of the genus. In many of the East Indian islands, large tracts are covered by these *Pandanus* trees or shrubs, growing in such profusion as to form impenetrable masses of vegetation, while species growing singly or a few together abound principally in the vicinity of the sea. The latter bear many thick aerial roots, which at a distance have the appearance of supporting the plant in the air. The leaves and roots are the parts of chief economic importance. The leaves are gath-

ered in large numbers, tied into bundles, and carried by the men to the villages, where the women remove with a large knife all spines from the margins of the leaf and the under surface of the midrib. The leaves are then exposed to fire, after which they are cut singly with a sharp four-bladed knife into strips of uniform width. After several days of soaking in water and bleaching in the sun, each strip is separately drawn between the thumb and a thin bamboo stick. By this treatment they become flexible and can be wrought into any desirable shape without injury to the fiber. Two plants in particular, 'pandan tikar' (*Pandanus Samak*), the mat screw-pine, and 'pandan laut' (*Pandanus fascicularis*), the seashore screw-pine, are considered as yielding the best grade of leaves for mat- and basket-weaving. Other species bearing larger and coarser leaves are regarded as inferior. Of these, the 'mengkuang' (*P. atrocarpus*), an arboreal form, is commonly found in swampy places. The leaves of this are made into hats, and into large mats which often serve for the entire sides of houses or for the covering of carts. Styles and designs in weaving differ in the different islands. In some places highly colored mats with red, green, brown and purple strips interwoven are to be found. The dyes used are said to be chiefly of vegetable origin. A red dye is extracted from the leaves of the teak, a green from the shoots of the banana, while brown or chocolate color is obtained by burying the strips in mud and water for several weeks. In some regions where species of *Pandanus* abound, these thick aerial roots are used for corks; sections of these roots several inches in length are beaten out at one end and thus made to serve as brushes. Leaf fibers from the leaflets of the 'nipah' (*Nipa fruticans*), a low, stemless palm, are woven into large shingles known as 'attaps.'

Fibers derived from the vascular bundles alone are obtained from the leaf-stalks of a common fern, *Dicranopteris linearis*. After the long bundles are split out from the stalks they are drawn separately through a series of holes of gradually diminishing sizes punctured in a piece of tin. With the strong fiber thus

obtained fine hats are made which are worn by the Malay men at their various festivals. The stems of the bamboo or strips and fibers obtained from them are put to a great variety of uses by the natives of the region.

Various food products of vegetable origin were then discussed. An important starch is sago, under which name are understood starches derived from several kinds of palms and cycads. Most of it, probably, comes from the trunk of *Metroxylon Sagu*, the true sago palm, which inhabits many of the islands of the Malay Archipelago. This palm grows to a height of forty feet or more and has a large, comparatively smooth trunk, from the interior of which the starch is derived. In the preparation of the sago a full-grown tree is selected just before the expansion of the inflorescence, the trunk is felled and cut into sections three or four feet in length, which are thrown into water and soaked for several days. Afterward, the outer fibrous portion is removed and the interior is reduced to a coarse sawdust by means of a crude grating apparatus. This sawdust-like powder is then put into a large vessel, where the starch is crushed out with the aid of water and the feet of a native. It is then drawn off, suspended in the water, and is finally dried and shipped away for refinement.

Palm sugar is derived chiefly from the sugar palm (*Arenga saccharifera*) and the cocoanut palm (*Cocos nucifera*). The sugar is obtained from the *Arenga* by binding the numerous branches of the pendulous inflorescence into a compact cylinder, without removing them from the tree, and then chopping off the ends and making several incisions along the sides of the branches. The sweet sap is caught in a vessel made from a bamboo-stem; it continues to flow for several days, is collected every twenty-four hours and is boiled down over a crude oven.

The paper was brought to a close with remarks on masticatories such as the betel-nut—the fruit of the *Areca* palm (*Areca Catechu*)—and on some of the edible fruits, such as the durian and mangosteen.

Mr. G. V. Nash showed flowering species of Melastomaceæ from the conservatories of the

New York Botanical Garden, including one of *Heterocentron elegans* from Mexico and one of *Medinilla magnifica* from the Philippines.

Dr. N. L. Britton exhibited specimens of two apparently undescribed species of poplar from Wyoming, one allied to *Populus tremuloides*, the other to *P. augustifolia*.

MARSHALL A. HOWE,
Secretary pro tem.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

THE 155th meeting was held on April 13 and Mr. J. S. Diller read a paper on 'The Composition and Structure of the Klamath Mountains.'

The lithologic, stratigraphic and faunal relations of the various sedimentary formations are considered in their order of development, beginning with the mica-schist, which is possibly of pre-Cambrian age. The Cambrian rocks of southeastern California and the Silurian rocks of the northern part of the Sierra Nevada have not yet been recognized in the Klamath Mountains, the oldest fossiliferous beds of that region being of Middle Devonian age. The stratigraphic succession of the Paleozoic and Mesozoic formations was discussed, and especial attention was devoted to the great unconformity which has been recognized at the base of the Cretaceous. The distribution of the marine and fresh-water Eocene in Oregon and the Miocene in California was indicated, as well as their relation to the development of the Trinity Basin.

In the next paper Mr. G. B. Richardson discussed 'The Stratigraphic Sequence in Trans-Pecos Texas North of the Texas and Pacific Railway.'

The rocks in this area range from pre-Cambrian to recent in age, most of the systems being represented. There are two areas of pre-Cambrian sediments: One is south of the Diablo Mountains between Eagle Flat and Vanhorn, where a group of folded and faulted formations consisting of silicious limestone, conglomerate, fine-textured red sandstone and schists is exposed. The other pre-Cambrian area is on the eastern flank of the Franklin Mountains, where there are about 3,000 feet of quartzite, slate and rhyolite.

The Cambrian is represented by 300 feet of sandstone of Acadian or Saratogan age exposed on the southeastern flank of the Franklin Mountains. Two other areas of sandstone of possible Cambrian age, but in which no fossils were found, are in the southern Hueco Mountains and northwest of Vanhorn.

The Ordovician is represented by about 1,200 feet of limestone in the Franklin Mountains. Three well-defined horizons are present, the Calciferous, the Galena Trenton and the Richmond. The Calciferous is also present in the southern Hueco Mountains and northwest of Vanhorn. A few isolated areas of limestone of the Niagara division of the Silurian occur in the Franklin Mountains.

The Devonian system and the Mississippian series of the Carboniferous are absent. The Pennsylvanian is represented by two limestone formations. The older occurs on the northwestern flank of the Franklin Mountains and the younger covers a large area in the Hueco, Diablo, Finlay and Cornudas mountains. These formations are each several thousand feet thick. In the Diablo Mountain region there is evidence that the pre-Pennsylvanian land was reduced to a peneplain.

Over 4,000 feet of rocks of Permian age containing a unique fauna which is being studied by Dr. G. H. Girty are present in the Delaware and Guadalupe Mountains. At the base of the section are 200 feet of black limestone. Above are over 2,000 feet of sandstone and interbedded limestone which are capped by 1,800 feet of massive white magnesian limestone. The relation of the Permian to the Pennsylvanian is concealed by the intervening Salt Basin.

A broad belt of gypsum, at least 300 feet thick, overlies these rocks and the gypsum is overlain by about 200 feet of sandstone and limestone which outcrop in a low range of hills west of the Pecos River. The age of these rocks is not known. They are either Permian or early Mesozoic.

The Jurassic is represented by a small limestone outlier of the Malone Mountains. The relations of these rocks to adjacent formations, however, is unknown, being concealed by unconsolidated basin deposits.

The Cretaceous is represented by the Fredericksburg and Washita divisions of the Comanche, which cover a considerable area. The Fredericksburg has been divided into three formations consisting of sandstone and limestone aggregating about 1,500 feet in thickness which are well exposed in the Finlay Mountains, about Sierra Blanca and in the southern Diablo Plateau. The Washita has not been subdivided. It consists of about 200 feet of buff-colored limestone and calcareous sandstone and shale well exposed near San Martine and Kent, and is present also in small outlying areas in the Sierra Blanca, Black and the Cornudas Mountains and in the vicinity of El Paso. There is evidence of the northward progress of the Comanche Sea in this area, shown by Washita rocks lying on the Carboniferous in the northern part of the area, while farther south rocks of Fredericksburg age immediately overlie the Carboniferous.

The Hueco, Salt and Toyah Basins—desert wash-covered areas characteristic of the Trans-Pecos country—are capped by unconsolidated detritus of Pleistocene age. Deep wells show that this material extends to considerable depths, and though no fossils have been found, possibly the lower deposits are of Tertiary age.

Mr. A. C. Veatch then discussed 'Some Peculiar Artesian Conditions on Long Island, N. Y.'

On Long Island, while the principles which govern artesian flows are necessarily those which produce the same phenomena elsewhere, there are certain essential modifications in the nature of the factors which produce these results. They may be briefly summarized as follows:

1. The deep zone of flow and the surface zone are essentially continuous. The whole island is composed of sands, with discontinuous clay masses, and the rain water is free to penetrate to any part of these beds without regard to dip.

2. The head depends not on dip of the strata, but on the curved nature of the ground water table, which gives to the water under a clay bed a pressure equal to the height of the

ground water above the edge of that clay mass, less the loss in transmission.

3. The dip of the strata is, therefore, immaterial, and flows, in many cases, are produced against or up the dip.

4. The slope of this ground water table is so precipitous at the heads of many of the deep reentrant bays on the north shore that a slight difference in porosity is sufficient to determine an artesian horizon, and wells in such situations and which penetrate nothing but sand and gravel are frequently artesian.

ALFRED H. BROOKS,
Secretary.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE five hundred and eighty-fifth meeting was held April 22 and 23 jointly with the American Physical Society. Reports of the papers read during the day sessions will appear in the proceedings of that society.

On Friday evening Mr. Alexander Graham Bell delivered a lecture on 'Tetrahedral Kites,' exhibiting numerous small kites and the cells out of which large structures are built up, and many lantern views of the large kites he has flown at his experiment station in Nova Scotia. The noteworthy features developed by the experiments were the great strength combined with lightness of the kites for a given lifting power; their ability to rise more nearly vertically above the point of attachment at the ground than other forms of kites; and their remarkable steadiness, especially when the broadside is toward the wind. The speaker intends to carry on his experiments during the coming summer.

CHARLES K. WEAD,
Secretary.

THE ASSOCIATION OF OHIO TEACHERS OF
MATHEMATICS AND SCIENCE.

THE association was organized at a meeting held in Columbus, April 2, 1904. At this meeting the following papers were read and discussed:

PRES. CHARLES S. HOWE, The Case School of Applied Science, Cleveland: 'The Effect of Entrance Examinations upon the Mathematical Work of the Preparatory School and the College.'

DR. GEORGE BRUCE HALSTED, Kenyon College, Gambier: 'The Value of Non-Euclidean Geometry to the Teacher.'

PROFESSOR FRANKLIN I. JONES, University School, Cleveland: 'The Laboratory Method in High School Mathematics.'

In his paper Dr. Halsted pointed out that the results of the recent studies on the foundations of geometry now permit a simple and rigorous treatment of elementary geometry without the introduction of either continuity or limits. The constructions of elementary geometry are possible without the compasses by means of the rules alone.

THE NORTHEASTERN SECTION OF THE AMERICAN
CHEMICAL SOCIETY.

THE fifty-second meeting of the section was held Friday evening, April 22, at Huntington Hall, Massachusetts Institute of Technology, Boston, with President W. H. Walker in the chair. About 650 members and friends were present. Professor W. P. Bradley, of Wesleyan University, gave an address on 'Efficiency Tests of the Wesleyan Liquid Air Plant and Demonstration of Liquid Air,' in which he described, and illustrated with lantern slides, the plant at Wesleyan University for the manufacture of liquid air, while the latter part of the lecture was devoted to a description of the properties of liquid air, which were demonstrated by numerous experiments.

ARTHUR M. COMEY,
Secretary.

DISCUSSION AND CORRESPONDENCE.

ELLIPTICAL HUMAN ERYTHROCYTES.

I WAS much interested in a note by Professor Melvin Dresbach, of the Ohio State University, published in SCIENCE, March 18, 1904, giving an account of examinations of human blood, in which about ninety per cent. of the red corpuscles were oval. What rendered this observation remarkable—and indeed unique—was the statement that:

The student in whose blood these corpuscles were found was a healthy mulatto about twenty-two years of age. His brother, who attended the university a few years ago, had normal red blood cells. Other than this no family history is at hand.